same reason as that used in any sequential decoding, such as a classical Viterbi decoder. In such instances, it is well known that the path metrics in the Viterbi decoder accumulate to a very large value in the trellis as time evolves. Typically, in order to reduce the path metrics dynamic range and the hardware bitwidth, any suitable normalization technique such as a slide window based method is used. For the same reason as would be commonly understood by one of ordinary skill in this art, Applicant uses known normalization techniques in order to normalize the probability by using division. This normalization procedure is important for the practical implementation of the finite bitwidth presentation of path probability. Accordingly, Applicant submits that one skilled in the art of classical Viterbi decoder can easily determine a detailed normalization algorithm.

Rejections under 35 USC §103(a)

The Examiner has rejected Claims 1, 4-5, 8-9, 13, 15, and 17 in view of Hoeher (IEEE publication) and Belveze et al. (USP # 6,389,574). Further, the Examiner has rejected Claims 2-3, 6-7, 10-12, 14, and 16 in view of Hoeher, Belveze et al. and further in view of Hladik et al. (USP #5,721,745). While the Examiner has extensively detailed her rejection, Applicant submits that a review of independent Claims 1, 8, and 15 within the set of Claims 1-17 is sufficient to address the combination of references mentioned above. More specifically, the base reference in the form of the Hoeher publication is believed by Applicant to fail to show or fairly suggest the method embodied within independent Claims 1, 8, and 15 as elucidated by the Examiner.

In Hoeher, the explicit steps for his standard SOVA algorithm is described in page 379 of that publication as follows:

for all states
determine survivor (A)
for all paths (A,....Ω)
for the "relevant length"
for the "relevant symbols"
update stored reliability
output final decision together with the M-ary reliability vector.

However, Applicant's Claims 1, 8, and 15 comprise substantially different methods including the inventive computing steps as outlined at page 10, lines 4-12 of Applicant's Specification as originally filed as follows:

For each state

For each path entering the state
Determine probability of entering state via path
For each symbol value
Extend probability vector for current symbol
Merge probability vectors for current symbol
Normalize over all states for current symbol time (optional)
Determine soft output for symbol time δ earlier.

Applicant respectfully submits that the prior art method in Hoeher only operates for the survivor path. Clearly, Hoeher does not determine the probability of entering the state via the path for each and every path as required by Applicant's method. Further, Hoeher only operates for his "relevant length" and only for the "relevant symbols." Applicant's method has no such limitation. Rather, Applicant's method is clear that the probability vector is updated for each and every symbol. For these reasons alone, Applicant submits that independent Claims 1, 8, and 15 are not shown or fairly suggested by Hoeher as stated by the Examiner. Because Claims 1, 8, and 15 are believed to be allowable over the base reference Hoeher either taken alone or in any combination with the other cited prior art and because Claims 2-7, 9-14, and 16-17, respectively, depend from these independent Claims 1, 8, and 15, Applicant submits that Claims 1-17 are each allowable over the prior art of record.

The Examiner has also rejected Claims 18-20 in view of Belveze et al. in combination with Hladik et al. More specifically, the Examiner stated that:

> "Regarding claim 18, Belveze et al. have all subject matter claimed except specify using logarithmic probabilities. However, Hladik et al. teach using logarithmic probabilities."

Applicant respectfully disagrees. There are two kinds of algorithms to generate the soft output from a decoder: Maximum A posterior Probability (MAP) and Soft Output Viterbi Decoder (SOVA). MAP uses bi-directional processing – i.e., forward and backward. MAP also computes exact probability for each bit without any approximation. The drawback for MAP is the decoding latency is every high. SOVA uses uni-directional processing. Because SOVA makes a selection to choose the survivor path, this selection makes a hard decision on those survivor paths and therefore the information on the non-survivor path is discarded. This is a known limitation of SOVA. The merit of SOVA is the minimum decoding latency. The present invention uses one-directional processing as SOVA to achieve the minimum decoding latency, but also uses the exact probability computing for each bit as MAP to achieve the best

performance. While Belveze et al. is an improvement over SOVA (such as the pure SOVA algorithm of Hoeher applied against Claims 1-17 above), Haldik et al. is a pure MAP algorithm. It is therefore not understood precisely how the combination of Belveze et al. and Haldik et al. are considered by the Examiner to precisely combine to form Applicant's Claims 18-20. More specifically, the Examiner has failed to particularly point out the subject matter being relied upon within the base reference Belveze et al.

Applicant respectfully submits that the Examiner has failed to satisfy her burden of factually supporting any conclusion of *prima facie* obviousness. The Examiner's attention is drawn to MPEP §2142 ("Legal Concept of Prima Facie Obviousness"), which provides in pertinent part:

> "To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation ... Second, there must be a reasonable expectation of success. Finally, the prior art reference(s) must teach or suggest all claim limitations. In re Vaeck, 947 F-2d 488, 20 USPQ 2d 1348 (Fed. Cir. 1991)."

Accordingly, the Applicant has no obligation to submit evidence of non-obviousness as relates to the blanket rejection of Claims 18-20 where the Examiner asserted that "[r]egarding claim 18, Belveze et al. have all subject matter claimed." Further, the Examiner is earnestly requested to explain with reasonable specificity the elements of Belveze et al. that show or fairly suggest at least Applicant's independent Claim 18. In the alternative, Applicant urges the Examiner to reconsider and withdraw the rejection.

Conclusion

Applicant respectfully submits that the above arguments are fully responsive to the outstanding Office Action. Reconsideration and allowance of Claims 1-20 is solicited. If the

Examiner does not receive the foregoing remarks in a positive light, she is earnestly requested to contact the undersigned by telephone in order to advance the application.

The Commissioner is hereby authorized to debit any underpayment or credit any overpayment to the USPTO deposit account no. 16-0600 should any additional fees be necessary.

Respectfully submitted,

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